NAVFAC
Naval Facilities Engineering Command
NAVFAC Mid-Atlantic

How Naval Facilities in Hampton Roads Are Coping With Rising Relative Sea Levels

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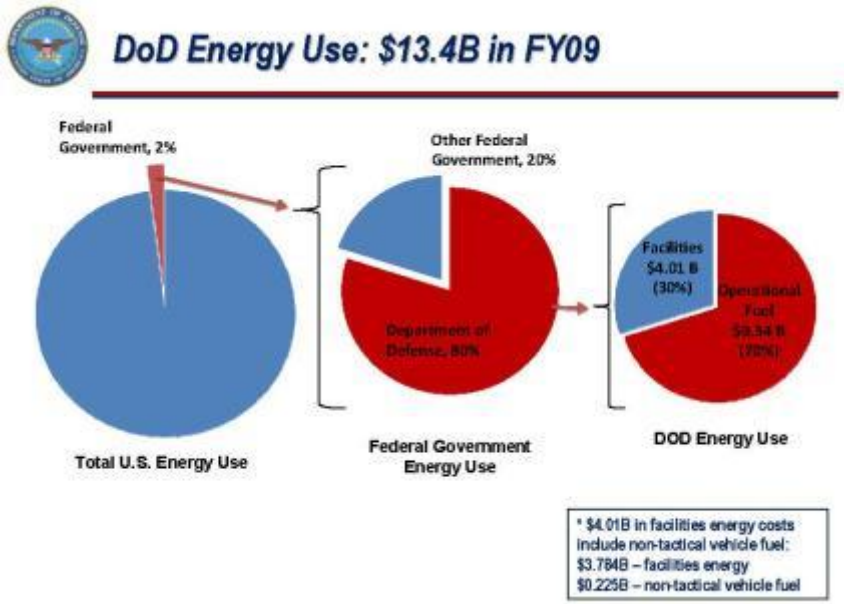
Federal Recognition of Climate Change

- Recognizes Climate Change and Environmental Impacts (SLR)
- Federal Government/DoD Large Footprint (307,295 buildings)
- Lead by Example
- Executive Orders, Federal Laws
- Policy and Implementation

2 Components

- Sustainability *(Reduction)*
  - Reduce Impact/Contributions
  - Energy Efficiencies (Reduce Costs)
  - Renewable Energy
- Adaptation/Strategy *(Response)*



FY09 $13.4B

- Federal Gov't 2%
- DoD 80%
- Facilities 30%

*Tom Morehouse OSD-DAT&L

Federal/DoD Climate Change Drivers, Policy, and Directives

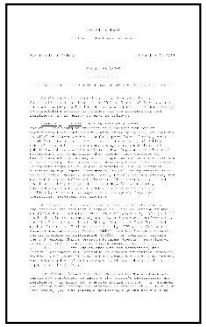
E.O. 13690: Establishing Federal Flood Risk Management Standard

- ***updates E.O. 11988: Floodplain Management***
- ***defines flood hazard areas based on: climate-informed approach, 100-yr flood plus 2-3 feet, or 500-yr flood elevation***

Federal → ***DoD*** → ***Navy*** → ***Tri-service***

E.O. 13514:

"Federal Agencies will reduce, monitor, track, & report GHG emissions"



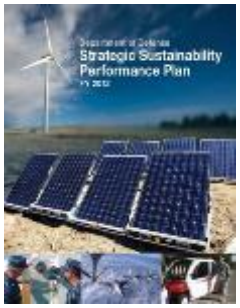
E.O. 13653:

"[facilitate] efforts to improve climate preparedness and resilience; help safeguard our economy, infrastructure, environment, and natural resources;"

2014 Quadrennial Defense Review (QDR):

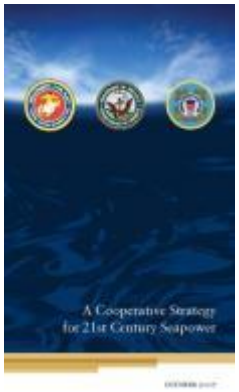
"Climate change poses a significant challenge ..."

"[DoD] will complete a comprehensive assessment of all installations to assess potential impacts of climate change on missions and operational resiliency, ... adapt as required"



Strategic Sustainability Performance Plan (2010):

"DoD will develop a plan to conduct initial vulnerability and risk assessments at each of its installations and facilities ..."



Maritime Strategy:

"Climate change is gradually opening up the waters of the Arctic"

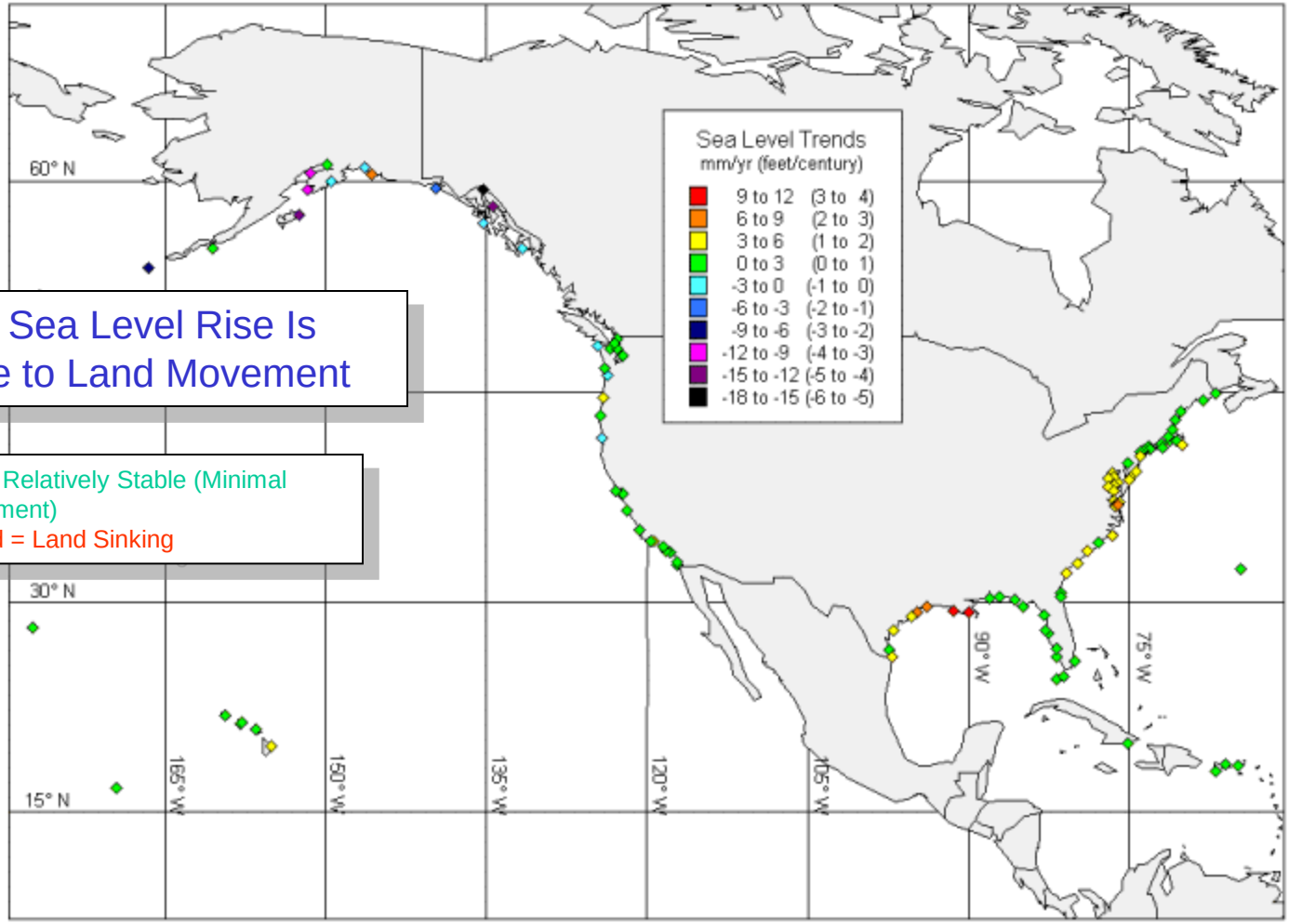
"These opportunities offer potential for growth, they are potential sources of competition for access and natural resources"

UFC 2-100-01:

"3-5.6.2.3 ... master planners will seek to understand, monitor and adapt to [changes in external conditions that impact planning decisions] ..."

UFCs under revision to incorporate SLR

Sea Level Rise – US Coast Lines



Local Sea Level Rise Is Relative to Land Movement

Green = Land Relatively Stable (Minimal Vertical Movement)
Yellow to Red = Land Sinking

NOAA Data

Hampton Roads Region Vunerabilities

- Region vulnerable to Relative Sea Level Rise (RSLR= water level increase + land subsidence)
  - RSLR projected 5.1 mm/yr (Sewells Point)
  - SLR est. ~ 1 ft by 2065 (Regionally)
  - NS Norfolk Pier elev. = 9.0 ft MLLW
  - Average Facility Life ≥ 50 years
  - Tide ~ 3.0 ft
  - CAT 1 Storm (74-95 mph, 4-5 ft surge)
  - 3' tide + 1' SLR + 5' storm surge = ~ 9 ft
  - Piers overtopped (not including wave action)
  - CAT 2 Storm (96-110 mph, 6-8 ft surge)
- Current piers, roadways, and utilities flood during Nor'easters or heavy rains
  - Pre-existing regional flooding problem
- Even if piers were raised, how do you cope with base access?
  - Navy dependent on civil infrastructure

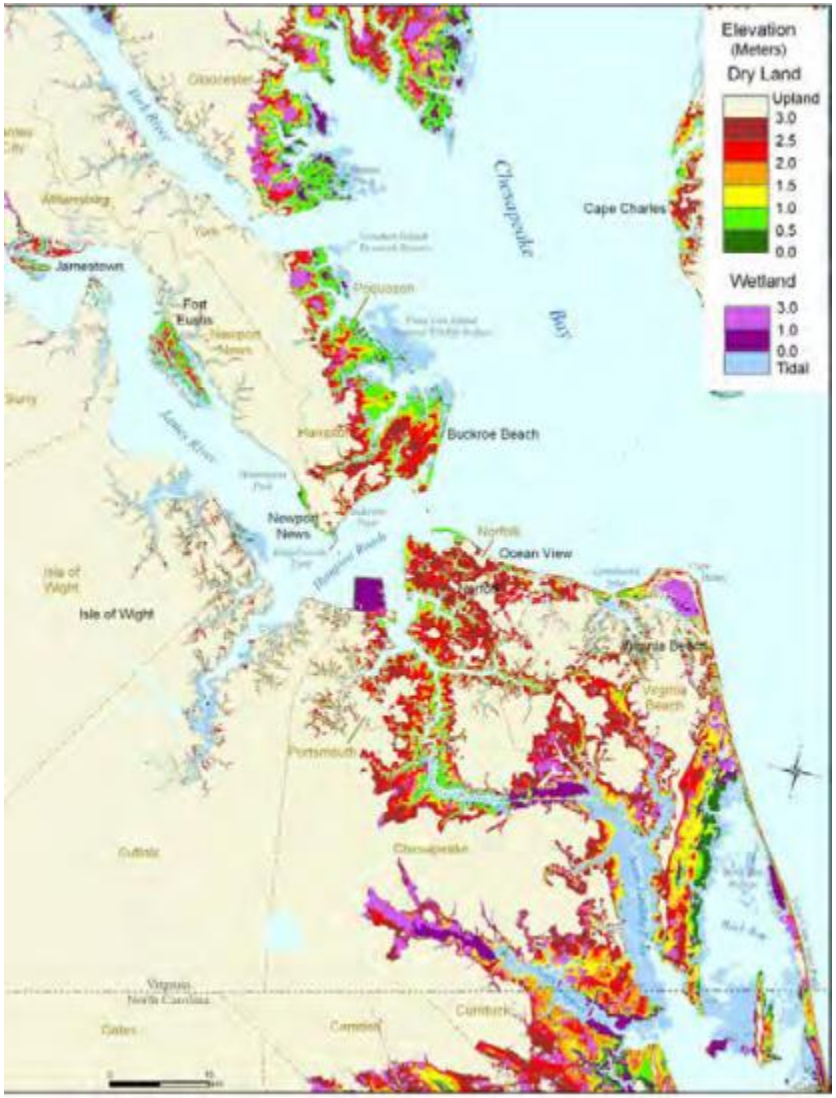
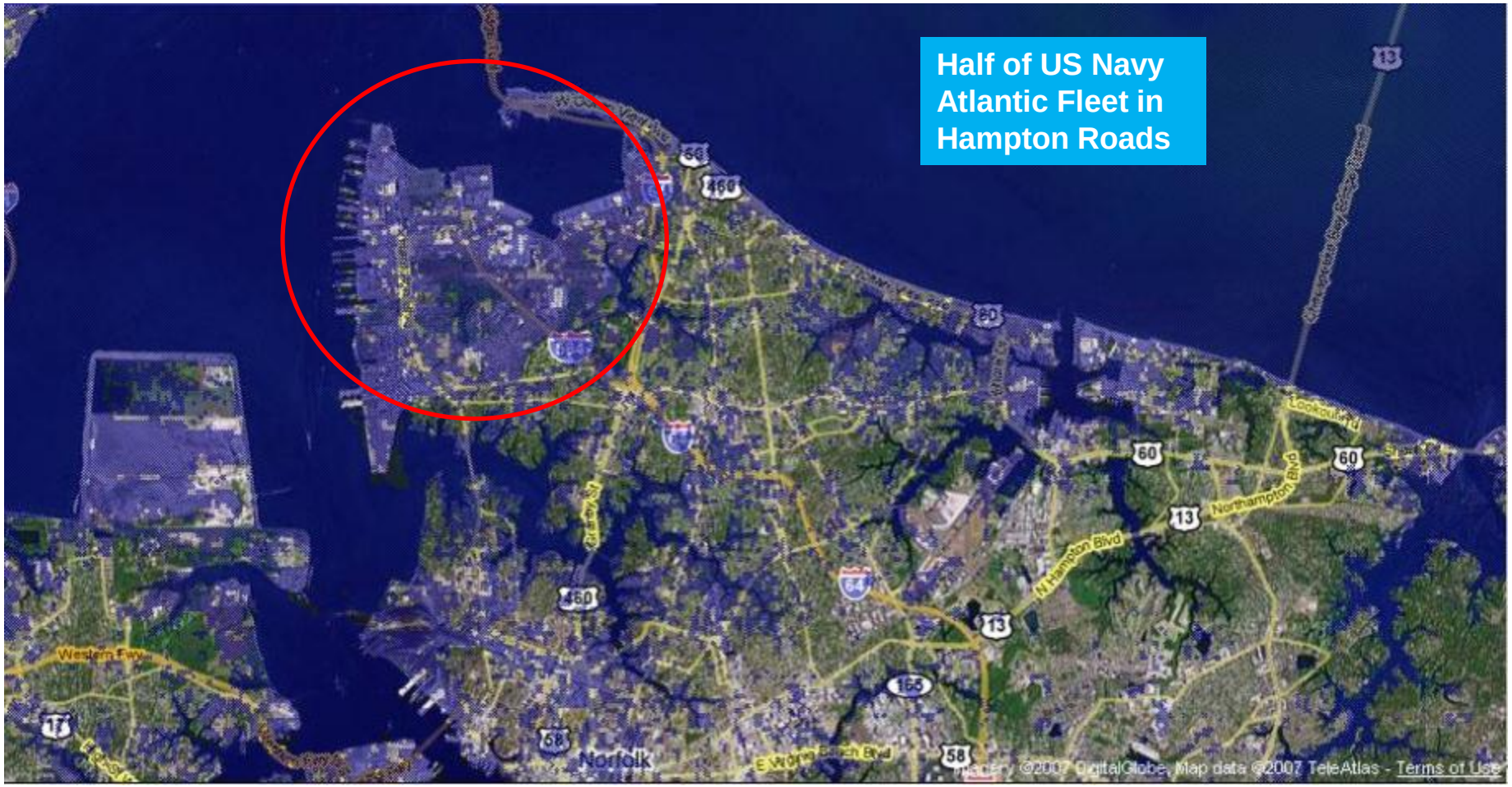


*figure from VIMS-HRPD

NS Norfolk and Surrounding Area



*** Storm Surge in Norfolk (Category 4: 15 ft)**

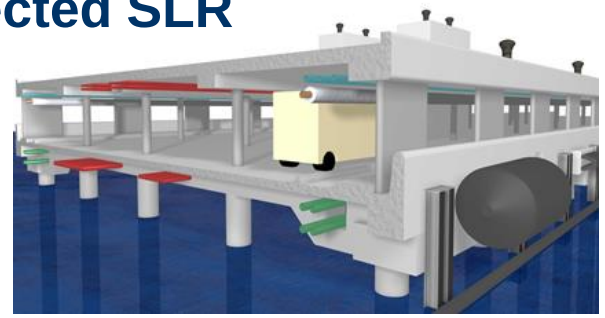
*figure from NFSEC

Sea Level Rise Impacts

- More frequent & severe storms
- Higher storm surge & wave action
- Base and roadway flooding
- Over-topped piers
- Utility damage and disruptions
- Shoreline erosion
- Pier & bulkhead scour
- Cost to secure utilities & facilities
- Land use and master planning
- Regional infrastructure impacts
  - Highways/roadways
  - Communications
  - Utilities
- ***Disrupts Fleet ops, maintenance, & training***

Adaptation/Mitigation Considerations

- **Site facilities out of areas potentially impacted by SLR**
- **Evaluating facility elevation based on projected SLR**
- **Protect existing infrastructure**
- **Shoreline protection**



- **Challenges:**
  - **SLR not limited to one technical discipline, facility or base**
  - **Mitigation may shift problem to another location**
    - Supporting infrastructure (roads, utilities, land)
    - Not limited to base
    - Platform compatibility (ships and aircraft)
  - **Mitigation is costly**
    - Difficult to justify to budgeteers based on scientific uncertainty
    - Can't do everything at once – adaptive management & programmatic approach

Incorporating SLR into Navy Facilities

Project Examples (SLR considered/indirect response):

- **Replace Fuel Pier D, NFT Craney Island, VA:**
  - **SLR factored in new deck elevation: +3 ft; pier as high as operations permitted**
- **Elevating utilities along waterfront as possible during repair**
  - **Double-deck piers at NSN, utilities on lower deck to protect from waves and flooding**
- **New BEQ at NSN (P-123) designed to incorporate resilient features (solar, storm-water management)**
- **Fort Story, VA & Dam Neck, VA Shoreline Projects:**
  - **Beach replenishment and shoreline protection due to mitigate erosion**
- **Dry-dock Flood Protection Study, NNSY & PNSY:**
  - **Evaluating dry-docks and critical support infrastructure protection from flooding & surge; 500-year flood considered, wave and SLR elevations may also be considered**
- **NWS Earle Installation Master Plan considering SLR impacts**
- **Incorporating higher building elevations, flood protection, and resilient features into project documents.**
  - **P-726, Operations & Maintenance Facility, JEB Little Creek-Ft Story**

Key Drivers to defending the Navy against SLR

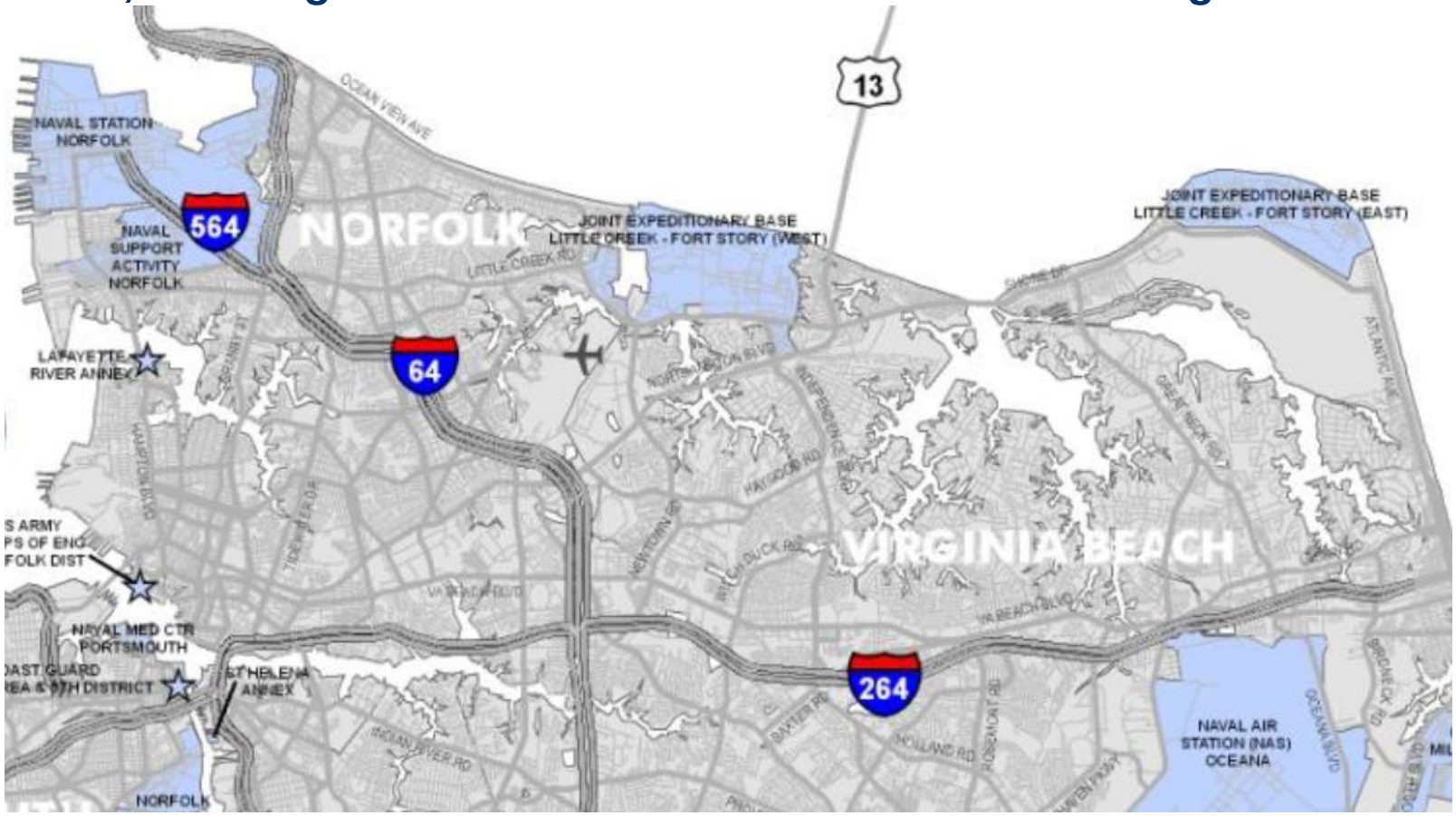
- **Education:**
  - Developing understanding of SLR, its impacts, and solutions
  - Working with U.S. Army Corps of Engineers, Virginia Institute of Marine Sciences, Municipalities, Universities, and Private sector on regional response/solution
  - Navy participation in workshops & discussions on infrastructure impacts of SLR & Navy's unique requirements
  - Communicating impacts of SLR to CNRMA/NAVFAC design & planning communities of practice
- **Planning:**
  - Incorporate SLR into Installation Development Plans, Region Shore Infrastructure Plans, & Global Shore Infrastructure Plan
  - Incorporate SLR into Criteria & Project Requirements
  - ***NAVFAC MIDLANT Guidance***: plan for 2 feet of SLR by 2050

Government Collaboration Intiatives: Force Multiplier

- **Local/State Engagement:**
  - Old Dominion University Adaptation workshops
  - VA Climate Change and Resiliency Commission
  - VA Recurrent Flooding Sub-panel, Secure Commonwealth Panel
  - Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Planning Pilot Project
  - Hampton Roads Planning District Commission
- **Federal/DoD Engagement:**
  - DoD Climate Change Adaptation Working Group
  - Navy Task Force Climate Change
  - Federal Climate Partners for the Mid-Atlantic
  - North Atlantic Coast Comprehensive Study
  - Navy Climate Readiness Community of Practice
  - NAVFAC Mid-Atlantic Sea Level Rise Working Group

Government Collaboration Intiative: JLUS

- **Developing innovative Joint Land Use Study (JLUS) in Hampton Roads partnering with the Hampton Roads Planning District Commission, Norfolk, and Virginia Beach to address recurrent flooding & SLR**



QUESTIONS?